CLAIMS

1. An apparatus for controlling a ribbon feed mechanism of a ribbon feed system which includes a supporting structure supporting a plurality of ribbon transport devices including a ribbon storage spool, a ribbon take-up spool, and at least one ribbon guide around which the ribbon is passed, there being a ribbon feed path including the ribbon guide, between the storage and take-up spools through an operating station where a work operation is carried out which utilises the ribbon, the ribbon transport mechanism in use, transporting the ribbon along the ribbon feed path between the storage and take-up spools, the apparatus including a mounting structure for mounting at least one of the ribbon transport devices so as to permit the respective device to move relative to the supporting structure in response to changes in ribbon tension occurring in the ribbon feed path, and a sensor device which is sensitive to such movements to provide an input which is dependant upon the extent of such movement, to a controller, the controller controlling operation of the ribbon transport mechanism in response.

2. An apparatus according to claim 1 wherein each of the ribbon take-up, and ribbon storage spools are rotatable about a respective rotational axes.

3. An apparatus according to claim 2 wherein the rotational axis of the spools are generally normal to the direction of ribbon movement around the ribbon feed path.

4. An apparatus according to claim 3 wherein the ribbon guide too has an axis generally normal to the direction of ribbon movement.

5. An apparatus according to claim 3 wherein the sensed movement of the respective ribbon transport device relative to the support structure is in a direction transverse to the direction of the respective axis of the device.

6. An apparatus according to claim 1 wherein the apparatus includes for the storage spool, a first mounting structure, and for the take-up spool, a second mounting structure, both of the first and second mounting structures permitting respective spool movements relative to the supporting structure in response to changes in ribbon tension, and there being a sensor device for each mounting structure to sense spool movements attributable to changes occurring in the ribbon tension.

7. An apparatus according to claim 6 wherein both sensor devices provide respective inputs to the controller which controls the ribbon transport mechanism in response.

8. An apparatus according to claim 7 wherein the ribbon transport mechanism includes a motor for each of the storage and take-up spools, which motors are individually controlled by the controller in response to the inputs from the respective sensor devices, to maintain ribbon tension within predetermined values.

9. An apparatus according to claim 8 wherein the controller determines a measure of the or at least one of the respective spool diameters, in order to control rotation of the spools to achieve a desired amount of ribbon feed during and/or subsequent to a work operation.

10. An apparatus according to claim 6 wherein the first or the second mounting structure includes a spool mounting part provided in an opening in the supporting structure.

11. An apparatus according to claim 10 wherein the spool mounting part is attached to the supporting structure by a connecting member which permits the spool mounting part, and hence the spool, to move relative to the supporting structure in response to changes in ribbon tension.

12. An apparatus according to claim 11 wherein the supporting structure includes a plate-like member providing the opening, and the connecting member includes a bridge which is integral with the plate-like member and the spool mounting part.

13. An apparatus according to claim 12 wherein the sensor device includes at least one transducer provided between the supporting structure and the spool mounting part to sense movements of the spool mounting part relative to the supporting structure.

14. An apparatus according to claim 13 wherein the or each transducer is a proximity sensor, or a strain gauge.

15. An apparatus according to claim 11 wherein the opening in the supporting structure in which the spool mounting part is provided, substantially surrounds the spool mounting part or is provided at an edge of the supporting structure.

16. An apparatus according to claim 10 wherein the spool mounting part includes a spindle on which the spool is mounted.

17. An apparatus according to claim 16 wherein the spindle is a driven shaft of a motor, the rotation of which to achieve ribbon transport, is controlled by the controller.

18. An apparatus according to claim 1 wherein movements of the ribbon guide relative to the support structure in response to changes in ribbon tension, are sensed by the sensor device to provide the input to the controller.

19. An apparatus according to claim 18 wherein the ribbon guide is a roller of a roller assembly.

20. An apparatus according to claim 19 wherein the mounting structure mounts the roller assembly on the supporting structure, at or towards one end of the roller, the mounting structure constraining the roller to move in a direction generally transverse to the direction of its longitudinal axis in response to changes in tension in the ribbon in the ribbon feed path, the sensor device including at least one proximity sensor provided on the supporting structure at or towards an opposite end of the roller to the mounting structure, to sense roller movements occurring in response to changes in ribbon tension and to provide the input to the controller.

21. An apparatus according to claim 20 wherein the mounting structure includes a pair of spaced apart leaf springs arranged generally parallel to each other and to the axis of rotation of the roller, the leaf springs being interconnected by upper and lower connecting members which each extend generally normally to the axis of rotation of the roller, whereby in response to changes in tension of the ribbon along the ribbon feed path, the springs

resiliently distort to constrain the roller to move sideways in a direction generally normally to the direction of its longitudinal axis.

22. An apparatus according to claim 19 wherein the mounting structure mounts a spindle of the roller assembly on the supporting structure at or towards the one end of the roller, an end part of the roller assembly at or towards an opposite end of the roller being received by a housing which includes the sensor device and which sensor device senses movements of the end part in response to changes in ribbon tension to provide the input to the controller.

23. An apparatus according to claim 22 wherein the sensor device includes a solid state transducer or combination of transducers.

24. An apparatus according to claim 19 wherein the roller carries a magnet, rotation of the roller being sensed by a sensor, whereby the amount of ribbon on each of the storage and take-up spools which changes as ribbon is wound onto the take-up spool, is determined.

25. A method of controlling a ribbon transport mechanism of a ribbon feed system which includes a supporting structure carrying a plurality of ribbon transport devices including a ribbon storage spool, a ribbon take-up spool, and at least one roller guide around which roller the ribbon is passed, a ribbon path including the ribbon guide, between the storage and take-up spools through an operating station where a work operation is carried out which utilises the ribbon, the ribbon transport mechanism in use, transporting the ribbon along the feed path between the storage and take-up spools, the method including providing at least one of the ribbon transport devices on a mounting structure which permits the respective device to move relative to the supporting structure

in response to changes in ribbon tension occurring in the ribbon feed path, and sensing such movements with a sensor device, providing an input which is dependant upon the extent of such movements, from the sensor device to a controller, and controlling operation of the ribbon transport mechanism in response.

26. A method according to claim 25 wherein the method includes sensing movements of both of the ribbon storage and take-up spools in response to changes in ribbon tension, with respective sensor devices, and providing inputs dependent upon the extents of spool movements from the sensor devices to the controller.

27. A method according to claim 25 wherein the method includes sensing movements of the ribbon guide relate to the support structure, in response to changes in ribbon tension, with a sensor device, to provide the input to the controller.

28. A method of determining when a ribbon in a ribbon feed system has broken, the ribbon feed system including in a supporting structure carrying a plurality of ribbon transport devices including a ribbon storage spool, a ribbon take-up spool, and at least one ribbon guide, around which roller the ribbon is passed, there being a ribbon feed path including the ribbon guide, between the storage and take-up spools through an operating station where a work operation is carried out which utilises the ribbon, and a ribbon transport mechanism for transporting the ribbon along the ribbon feed path between the storage and take-up spools, the method including providing at least one of the ribbon transport devices on a mounting structure which permits the respective device to move relative to the supporting structure in response to changes in ribbon tension occurring in the ribbon feed path, and sensing with a sensor device a

movement of the or one of the ribbon transport devices which indicates that the ribbon has broken, and providing an input from the sensor device to a controller which operates an indicating device which indicates that the ribbon has broken.